

this also was only a liver in appearance, that the liquid secreted was also the principal digestive liquid emulsionizing the fatty bodies, transforming the albuminoids into peptones and producing glucose at the expense of amylaceous matters.

The epithelium, consisting of voluminous cells, of the cæca of the Phalangida has the most analogy with the cellular elements of the supposed liver of the Araneida; but, what is more positive, the liquid secreted in abundance also transforms the feculents into glucose slowly, dissolves the albuminoids actively, and energetically emulsionizes the fats.

The cæca of the Phalangida are therefore not the analogues of the cephalothoracic suctorial sacs of the Araneida, but the evident analogues of their abdominal digestive gland. It results from this, (and direct observation also proves it), that the large median sac is the principal place for digestion, and consequently the middle intestine.

The Gourami and its Nest.

By M. CARBONNIER.

I have of late years had the honour of making known to the Academy the curious and interesting habits of certain fishes of the group Labyrinthici. In these species, at the time of reproduction, the males become adorned with the most vivid colours, construct a nest to shelter the products of the spawning, and during the embryonic development, as also after hatching, give a careful and efficacious protection to their progeny—facts which indicate a highly developed instinct in these creatures, and reveal the existence of faculties of which they have heretofore been regarded as destitute. Among these are the *Macropodi* of China and the *Colisæ* of India. The study of another fish of the same family, the Gourami (*Osphromenus olfax*) has furnished me with subjects of no less astonishment and admiration.

The Gourami, an inhabitant of the fresh waters of China and India, is remarkable for the large size to which it may grow and for the goodness of its flesh, which renders it a valuable article of food.

My trials in former years not having given any result, I determined last spring to keep my fishes in a medium maintained artificially at a constant temperature of 25° C. (=77° F.), which it appeared to me must be suitable for their reproduction. With this view, my fishes were placed in an aquarium containing about 48 gallons of water. In a few days I saw the bodies of the males become adorned with vivid colours; they pursued each other, and seemed to struggle furiously for the possession of the females. I then selected the finest male, whose lips were tumefied in an abnormal fashion, and left him alone in the aquarium with a female which he seemed to pursue perseveringly. He soon commenced in one of the angles of the aquarium the formation of a nest of froth, which in a few hours attained a considerable size—6 to 7½ inches in diameter, and 4 to 4¾ inches in height.

In the Chinese *Macropodus* the male draws directly from the outer

air the bubbles which he emits beneath his frothy roof after having englobed them (in order to prevent their being absorbed) with the mucosity furnished by his buccal membrane. The mucous secretion does not seem to be formed in such abundance in the Gourami; hence my male found himself under the necessity of preparing his materials beforehand, then collecting those which appeared to him to fulfil the desired conditions, and carrying them to his nest. For this purpose he kept at the surface of the water, turning his back to the nest, and, drawing in the outer air, expelled it by degrees in front of him in the form of gaseous bubbles. The badly prepared bubbles burst, and there only remained those the envelope of which possessed the suitable consistency; these he then collected and carried into his nest.

At times the buccal secretion seemed to slacken, and the male could no longer elaborate his globules. He then descended to the bottom of the water to seek for some *Confervæ*, which he sucked and chewed for a few moments as if to excite and reawaken the activity of the mucous membrane.

The nest being completed, the male watched it with patient care, and whenever the female approached it he displayed his brilliant colours. At a given moment his body, by several simulated approaches, having acquired sufficient flexibility, he caught the female, and caused her to perform a first spawning; others speedily followed, and were renewed nearly forty times in three hours.

A *Macropodus* or a *Colisa* would not have been embarrassed about collecting the eggs and arranging them in the nest. My Gourami did not appear to understand taking them in his mouth; and in order to raise them to the surface he made use of a most curious stratagem. He rose to take in an abundant provision of air; then, descending, he placed himself well below the eggs, and suddenly, by a violent contraction of the muscles of the interior of the mouth and pharynx, he compelled the air collected there to escape by the gill-apertures. This air, infinitely divided by the branchial lamellæ and fringes, was, so to speak, pulverized; and the violence of the expulsion was such that it escaped in the form of two jets of a regular gaseous powder, which enveloped the eggs and conveyed them to the surface.

Nothing could be more curious to witness than this manœuvre of the male Gourami. He disappeared completely in the midst of a regular fog of air; and when the latter broke up he reappeared, bearing attached to the rugosities of his scales and fin-rays bubbles of air resembling thousands of little pearls.

The number of eggs produced during this spawning may be estimated at two or three thousand, out of which I only obtained six hundred hatchings, most of the eggs not having undergone the action of the fecundating principles.

The first period of incubation lasts three days; and then commences a series of modifications analogous to those which I have already noticed in other species. The tadpole swims with its belly in the air, and has the form of a ball terminated by a little tail; but after another period of three days (that is to say, six days after

hatching) the embryonic development is completed, and already a certain number of the young fry venture to escape from under the paternal eye. The male pursues the fugitives; and a few jets of pulverized air shot in their direction soon bring them to reason and convey them again to the surface of the water. It is not until about ten days after their birth that the father begins to abandon them and leave them to wander at their own pleasure.

Five hundred and twenty young Gouramis hatched in my establishment in the month of July last, and, measuring at present from 3 to 6 centimetres in length, assure to us the definitive possession of this interesting and curious species of fish, which, among other advantages, possesses the faculty of spawning several times a year.—*Comptes Rendus*, Dec. 4, 1876, p. 1114.

Zoology of the 'Challenger' Expedition.

Mr. Alexander Agassiz, in a letter to the editors of 'Silliman's Journal' (dated Edinburgh, Dec. 18), states that he has found the material a wonderful collection, and was deeply impressed by the great amount of it, coming as it mainly does from the depths with which we formerly associated the idea of a lifeless desert region. He also gives the following information respecting the publication of the results. "The Admiralty is to publish the results; and the collections are to be worked up by sundry specialists:—Allman the Hydrozoa; Busk the Polyzoa; Dr. McIntosh the Annelids; Thomson himself the Crinoids and some of the Sponges, the balance of the latter by O. Schmidt; Hæckel the Radiolaria; Moseley, of the 'Challenger,' the Polyps; Murray, who was on the 'Challenger,' will work up the deep-sea bottoms and surface animals (Foraminifera, &c.); Günther the Fishes. Some of the groups are not yet determined upon; but the same persons who worked up the 'Porcupine' species will probably have charge of the 'Challenger' collection. Young Carpenter will work up the Comatulæ; Lyman will have the Ophiurans; and I shall bring over with me the Echini, and perhaps some other group of Echinoderms; so that the United States will have their fair share of the work."

Rate of Growth of Corals.

A remarkable piece of coral, taken off the submarine cable near Port Darwin, is spoken of by the 'Cocktown Herald.' It is of the ordinary species, about five inches in height, six inches in diameter at the top, and about two inches at the base. It is perfectly formed; and the base bears the distinct impression of the cable, and a few fibres of the coir rope used as a sheath for the telegraphic wire still adhering to it. As the cable has been laid only four years, it is evident that this specimen must have grown to its present height in that time, which seems to prove that the growth of coral is much more rapid than has been supposed.—*Silliman's American Journal*, February 1877.